STATE OF CALIFORNIA
REGIONAL WATER QUALITY CONTROL BOARD
SAN FRANCISCO BAY REGION

EXECUTIVE OFFICER'S SUMMARY REPORT
MEETING DATE: April 9, 2014

ITEM: **8**

SUBJECT: **The Fourth Revolution in Urban Water: Implications for California –** Presentation by David Sedlak, Professor at UC Berkeley and Deputy Director of ReNUWIt

DISCUSSION: David Sedlak has recently released a new book, *Water 4.0: The Past, Present and Future of the World's Most Vital Resource.* In his book, he focuses on the challenge that dwindling water supplies pose to society by building an understanding of the three historic revolutions in urban water systems and how that understanding drives the needs and opportunities available to us in undertaking the fourth revolution or "Water 4.0." His book parallels his work as the Deputy Director of the Engineering Research Center for Re-inventing the Nation's Urban Water Infrastructure or "ReNUWIt." ReNUWIt is a consortium of UC Berkeley, Stanford University, Colorado School of Mines, and New Mexico State University funded by the National Science Foundation that aims to jump-start the technology change necessary to develop the urban water systems of the future that would use less energy and resources and provide more social and ecological benefit. Both Board members and Board staff have been involved in ReNUWIt as it enters its third year.

Professor Sedlak's presentation will tie together the messages from his book and the work ReNUWIt has undertaken to describe how this can drive California's future urban water development and what decision-makers should consider as they face California's crumbling water infrastructure and dwindling water supplies. His recent essay in the Wall Street Journal (Appendix A) provides a point-of-departure for his presentation.

RECOMMEN-DATION: This is an information item only, and no action is necessary.

APPENDIX A: David Sedlak essay, "The Thirsty West Needs a Water Revolution"

APPENDIX A

THE THIRSTY WEST NEEDS A WATER REVOLUTION

Using smart sprinkler systems, reverse osmosis and 'capture ponds' to avoid a parched future

BY DAVID SEDLAK

CALIFORNIA HAS BEEN suffering from a crippling drought, but it is hardly alone in its water struggle. Since 2010, rainfall in Texas has declined so markedly that several dozen communities are in danger of running out of water. The Rockies have also been stubbornly dry—reducing the flow of the Colorado River enough to force Las Vegas to invest more than $800 million to build new intake pipes to ensure that water continues to flow into its treatment plant on Lake Mead.

If scientists are right about the effects of climate change, these water shortages aren't going to be a passing phase. With less precipitation, diminished snowpack (and thus less springtime runoff) and more evaporation from higher temperatures, Western cities will need to wean themselves from the massive, imported water systems and overtaxed aquifers on which they now rely, and U.S. agriculture will need to manage with more expensive and less plentiful water.

Fortunately, there are practical ways that the American West can deal with the prospect of a parched future. Technologies and policies developed in response to previous shortages are creating new ways to obtain, conserve and supply water. This quiet revolution could insulate western cities from future droughts—and point to the next phase of humanity's relationship to water itself.

In times of drought, conserving water has always been the first line of defense. It is also the best way to decrease water demands in rapidly growing cities. Over the past two decades, changes in national plumbing standards have resulted in more buildings being equipped with low-flow fixtures, thereby dramatically cutting indoor water use. Many cities are also turning to technologies developed for high-tech agriculture to reduce outdoor water use. Smart sprinkler systems with moisture sensors and Internet connections that link them to weather stations can cut water use by up to 40% without sacrificing green lawns.

Still, extended droughts can overwhelm the gains of even the most miserly water-conservation programs. Just ask the citizens of Australia, where a drought that began in 2003 forced all of the country's big cities to develop new water supplies. Australia invested about $9 billion in seawater desalination plants—a shovel-ready response to the crisis. In Perth, the city hardest hit by the drought, desalination plants powered by a wind farm and a solar energy plant now provide about half of the drinking water. As technology has grown more efficient, desalination's energy consumption and operating costs have dropped by some 40% over the past two decades.

Southern California has followed a different path, driven by worries about the cost and potential environmental damage of desalination plants. Since the 1970s, communities in southern California have been feeding the treated water flowing from a handful of their wastewater-treatment plants back into the region's groundwater. This drew on some of the same technology (known as reverse osmosis) that made seawater desalination possible. But southern California's utilities chose the cheaper option of passing wastewater effluent, which is significantly less salty than seawater, through the reverse-osmosis membranes. Engineers there now plan to use this technology to satisfy the water needs of about 15% of the region's population by 2025.

The West's biggest city, Los Angeles, has new plans to construct massive ponds to capture the rain that falls on the city's roofs and streets. Most of sun-baked southern California's precipitation arrives in a handful of winter storms, so Los Angeles will need to turn abandoned rock quarries and sand mines into "capture ponds" to collect storm water. In the past, cities without such storage ponds might have employed green roofs and rain gardens to briefly slow the movement of rainwater into nearby rivers to reduce the risk of flooding. But L.A.'s new systems are designed to gradually feed large amounts of captured water into drinking-water aquifers after passing it through constructed wetlands—creating a new water supply while preventing neighborhood flooding and keeping coastal beaches clean.

Over the past 2,500 years, the need of city dwellers for water has driven a series of revolutions. The first came when modernizing European cities replicated the aqueducts and sewers first built by the ancient Romans. The second came when cities learned how to treat their drinking water to stop waterborne diseases such as cholera and typhoid. The third came when sewage-treatment plants became standard features of cities' water systems and started saving the waterways downstream from pollution.

The fourth, quiet water revolution is upon us now, unfolding across the mountains and rivers of the American West.

Associated Press

A WATER BUOY lies on the bed of Lake Mendocino in California, which is suffering a three-year drought.

Dr. Sedlak is the Malozemoff Professor in the department of civil and environmental engineering at the University of California, Berkeley. This essay is adapted from his new book, "Water 4.0: The Past, Present and Future of the World's Most Vital Resource," published by Yale University Press.